MINISTRY OF STATE ADMINISTRATION AND PUBLIC FUNCTION

NATIONAL INSTITUTE FOR DISASTER MANAGEMENT (INGC)

ENHANCING DISASTER PREPAREDNESS FOR RESILIENCE THROUGH CLIMATE INFORMATION MANAGEMENT

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Beijing, October 2017

Presentation Outline

- Overview of climate hazards
- Disaster typology and its effect
- Trends of disaster and its impacts
- Changes in DRR over time
- Examples of use of climate information and types of forecast in enhancing disaster preparedness for resilience
- Example of rainfall forecast/estimation based on the SWFDP
- Hydrological information
- Challenges to access and usage of climate information

Overview of climate hazards

Mozambique is highly vulnerable to natural hazards and disasters for a number of reasons. About 60 per cent of the population live along the coastline. This area is vulnerable to an increasing occurrence of **cyclones and rising sea levels,** because nearly 45 per cent of the country is 100 meters below sea level.

The country is also a lower riparian zone of nine international rivers, and more than 50per cent of the country's water flows depend on the countries upstream.

Drought particularly affects the southern and central regions in the **arid and semi-arid regions in the Gaza and Inhambane, Tete, Manica provinces, while flooding mostly affects the Zambezii, Licungo and Limpopo basins.** About a quarter of the total Mozambican population is at risk from natural hazards.

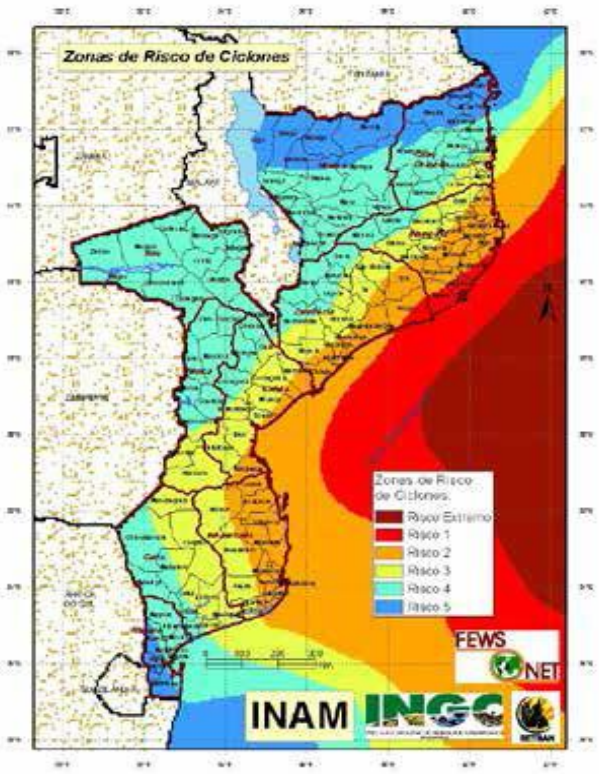
The main disasters affecting Mozambique are **floods, cyclones and droughts.**

Floods and its effects

Year	Event
2015	Flooding along Licungo river basin: 188000 people affected
2013	Flooding along the Limpopo river basin: 176,000 people displaced; 117 deaths and economic losses
2008	Flooding of the Zambezi river basin: 258,000 people displaced
2007	Flooding of the Zambezi river basin: 250,000 people displaced
2001	Flooding of the Zambezi river basin: 500,000 people displaced; 115 deaths
2000	Worst floods in 150 years. Unprecedented rains and three cyclones caused flooding of the Limpopo, Umbeluzi, Incomati, Buzi and Save rivers, displaced 2 million people and claimed 640 lives
1999	Floods in the provinces of Sofala and Inhambane: heaviest rains in 37 years. National EN1 highway closed for two weeks, cutting off road traffic between the south and north of the country: 300,000 people displaced 100 deaths
1997	300,000 people displaced and 100 deaths
1996	Flooding of all southern rivers: 200,000 people affected
1985	Southern region affected by the worst floods in 50 years after 4 years of droughts: 500,000 people displaced
1981	Limpopo river basin: 500,000 people displaced

Flooding scenarios in Mozambique have demonstrated a relatively well defined pattern with regard to their timing and geographical locations. They occur every two to three years along the seven major rivers that cross the country, **namely the Incomati, Limpopo, Save, Buzi, Pungue, Zambezi and Licungos**. The map shows critical flood prone areas in Mozambique. The extent of flooding depends not only on the amount of rainfall in the country but also on the amount of rainfall in neighbouring countries, where flooding rivers originate. In 2000-2001, Mozambique experienced its worst flo 150 years. It affected about 2 million people.

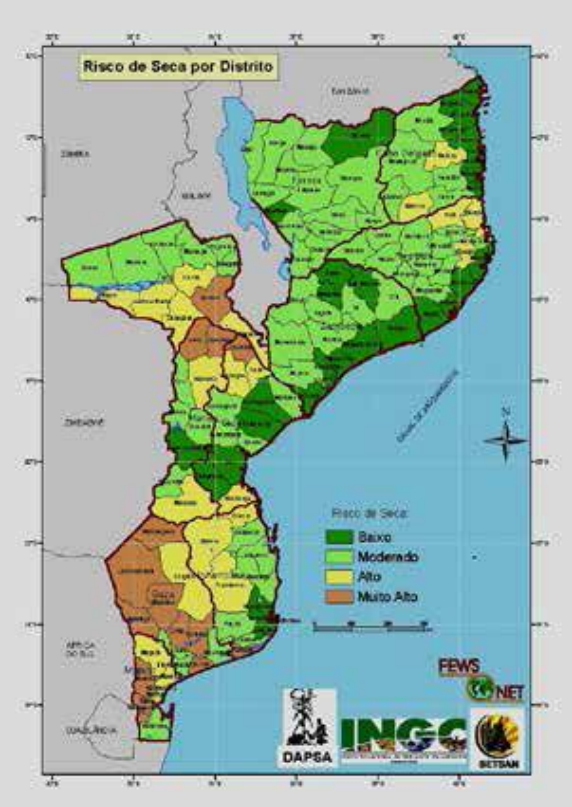
Cyclones and its effects



Year	Event
2017	Cyclone DINEO 550959 People affected(their houses and/or other properties such as crops partially or totally destroyed), 91 people injured,
2008	Cyclone Jokwe: 200,000 people affected (their houses and/or other properties such as crops partially or totally destroyed)
2007	Cyclone Favio: 160,000 people affected (their houses and/or other properties such as crops partially or totally destroyed)
2003	Cyclone Japhet: 100,000 people affected (their houses and/or other properties such as crops partially or totally destroyed)
2000	Cyclone Udah: 11,000 people affected (their houses and/or other properties such as crops partially or totally destroyed)
2000	Cyclone Gloria:650,000 people affected (their houses and/or other properties such as crops partially or totally destroyed)
2000	Cyclone Eline: 650,000 people affected (their houses and/or other properties such as crops partially or totally destroyed)
1997	Cyclone Lisette: 80,000 people affected (their houses and/or other properties such as crops partially or totally destroyed)
1996	Cyclone Bonita: 200,000 people affected (their houses and/or other properties such as crops partially or totally destroyed)
1994	Cyclone Nadia: 900,000 people affected (their houses and/or other properties such as crops partially or totally destroyed)
1988	Cyclone Filão: 90,000 people affected (their houses and/or other properties such as crops partially or totally destroyed)
1984	Cyclone Demoina: 350,000 people affected (their houses and/or other properties such as crops partially or totally destroyed)

Tropical depressions or cyclones that enter Mozambique from the southwest of the Indian Ocean frequently hit the country's long coastal area. The map (see figure 4) shows the geographical pattern of cyclone proneness in Mozambique. In red (along the coast) are the most highly prone areas, and in green (inland) the least prone areas. From January to March, there is a greater risk of cyclone occurrence. The National Meteorological Institute (INAM) monitors cyclone activity.

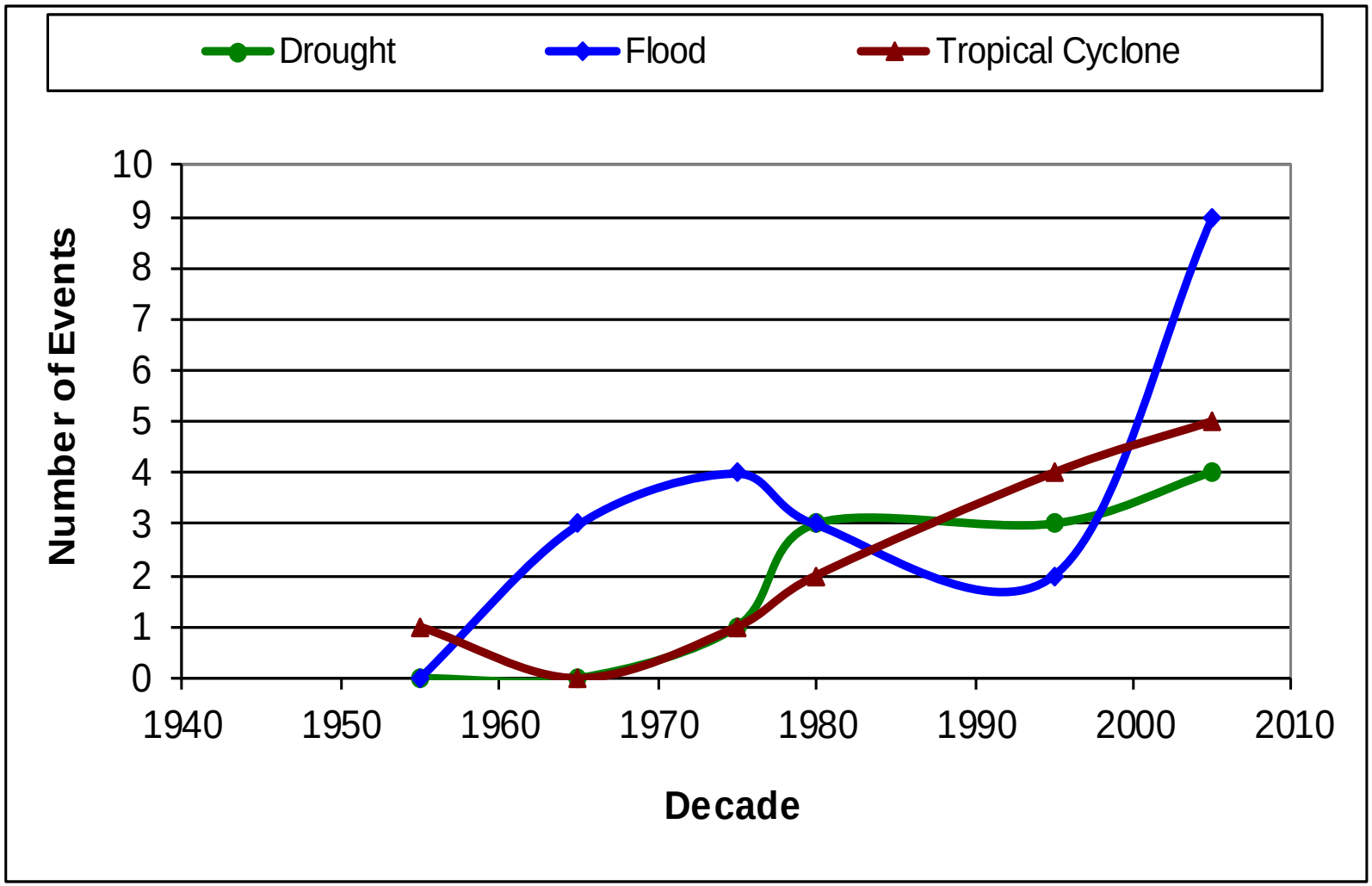
Droughts and its effects



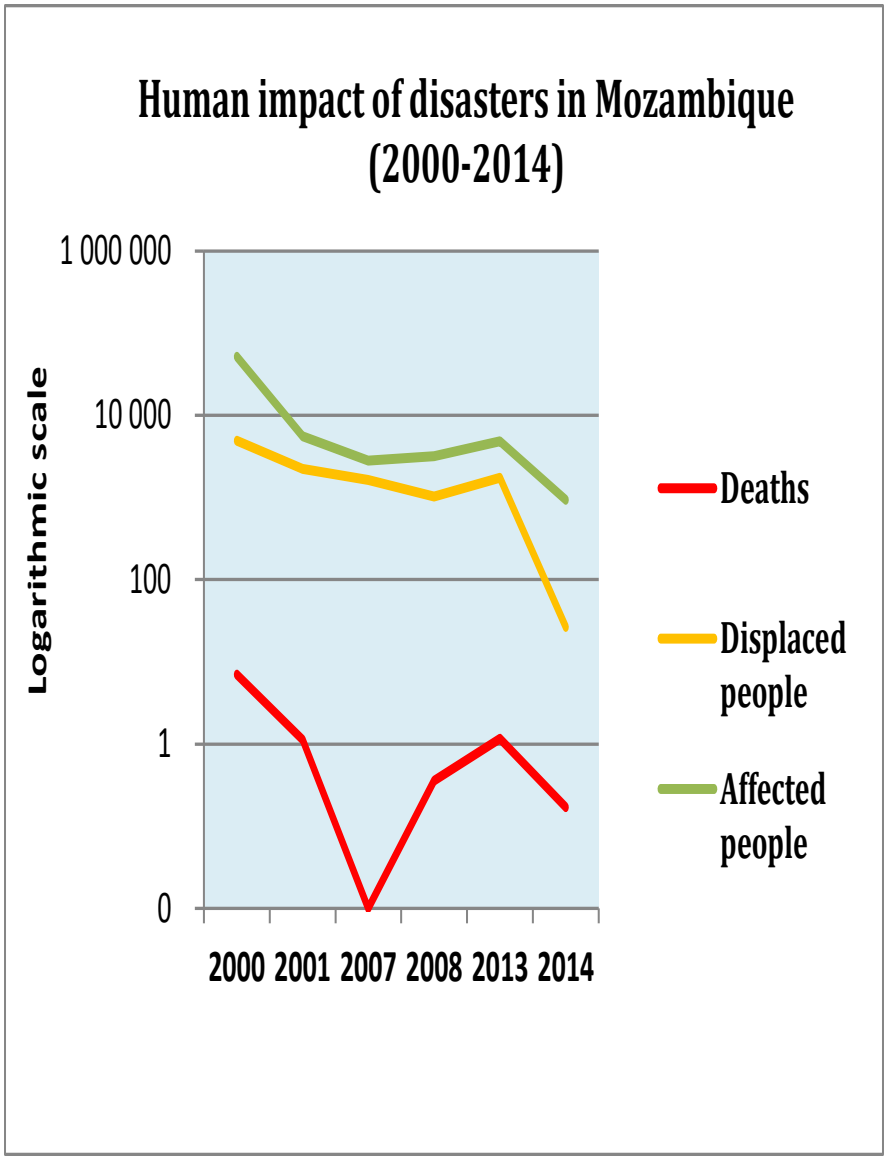
Year	Event
2015-2016	1,500,000 in need of food assistance in the southern and central regions
2015-2018	60 districts and 350,000 in need of food assistance in the southern and central regions
2015-2019	60,000 people requiring food assistance in the southern and central regions
2015-2020	520,000 requiring food assistance in the southern and central regions
2015-2021	600,000 people in need of food assistance in the southern and central regions
2015-2022	600,000 people requiring food in the southern and central regions
2015-2023	100,000 people requiring food assistance in the southern and central regions
2015-2024	1.5 million people requiring food assistance in the southern and central regions with a high shortage of drinking water and cholera outbreak
2015-2025	1.32 million people requiring food assistance countrywide with a high shortage of drinking water and cholera outbreak
2015-2026	8,000 people requiring food assistance in the Inhambane province
2015-2027	Long dry period countrywide, combined with the civil war, claimed about 100,000 lives and put nearly 5 million people in need of food assistance
2015-2028	60,0000 people in need of food assistance in the southern and central regions

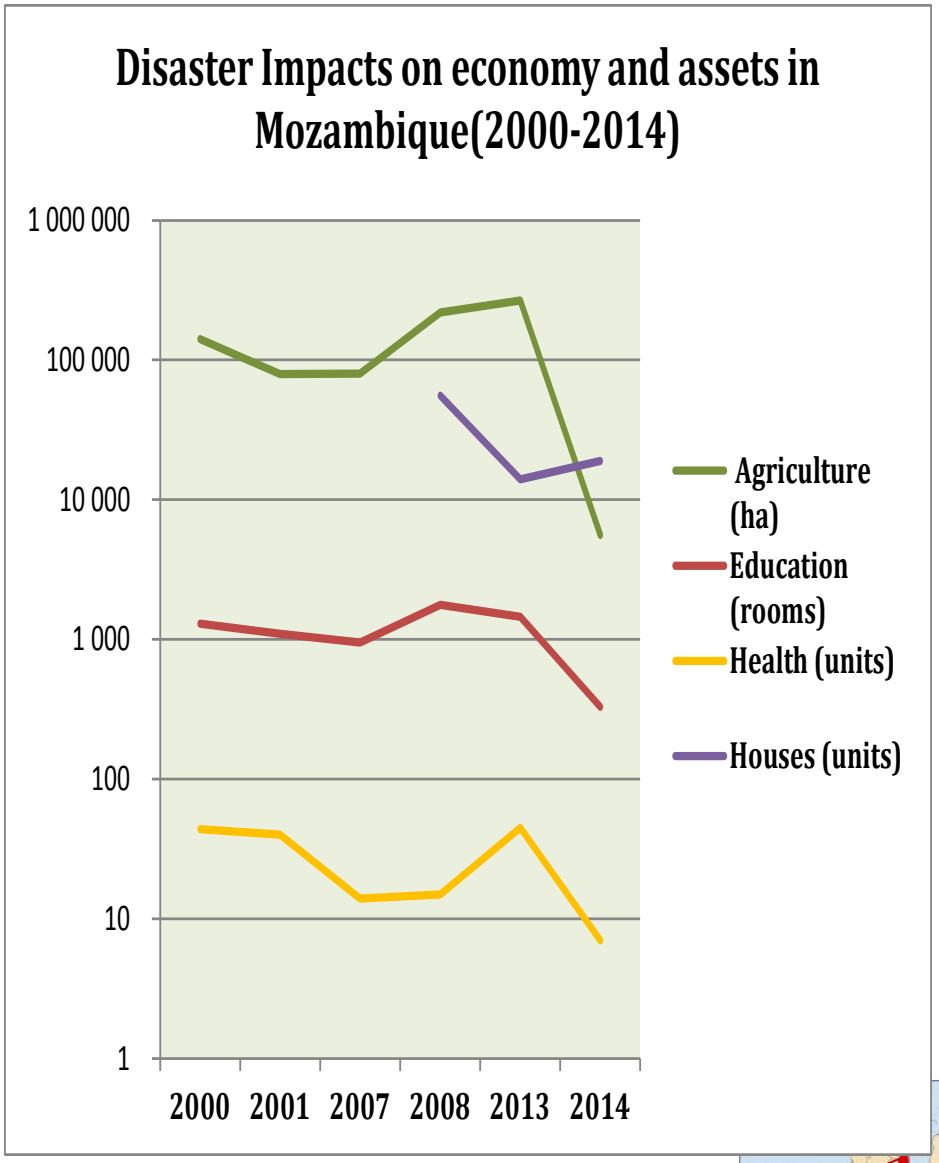
Cyclical droughts, which occur every two to three years, have affected Mozambique. The south of the country has experienced drought for five of the last seven years. Droughts are likely to occur every year and are relatively chronic, particularly in the southern and central parts of the country. It is not only the total amount of rainfall that determines the occurrence of drought, but its spatial and temporal distribution as well. Prolonged dry spells can easily lead to drought, particularly in remote areas, where agriculture is absolutely dependent on rain-fed crops. As a result, vulnerable communities may experience reduced access to water, outbreak of com diseases, hunger and eventually malnutrition.

Trends in disasters (1956–2008)



Trends of disaster impacts





Changes in DRM over time

The 2000/2001 floods – key lessons for:

i.Rapid investment for improving early warning network for climate and weather data collection (Central level)

ii.Focus of dissemination of risk information on end-users (District and community level)

iii.Strengthening of preparedness and response capacity at national and local level

iv.National leadership of DRR actions, including in disaster preparedness and response

v.Improvement of cross-sectoral coordination mechanisms for all DRR activities

vi.Policy reforms to foster DRR mainstreaming at national sector development planning

Examples of use of climate information and types of forecast in enhancing disaster preparedness for resilience

i. **Climate predictions for 2040-2060 (in 2009):** bases for conduction of Disaster Risk Assessments at national and sector levels (in 2012)

ii. **Seasonal weather forecast (SARCOF):** enables preparation of the Annual National/Sector Development Plan and the Contingency Plan at all levels

iii. **Weather forecast:** helps refine disaster response mechanisms

iv. **Warnings:** allows ignition of disaster response operations.

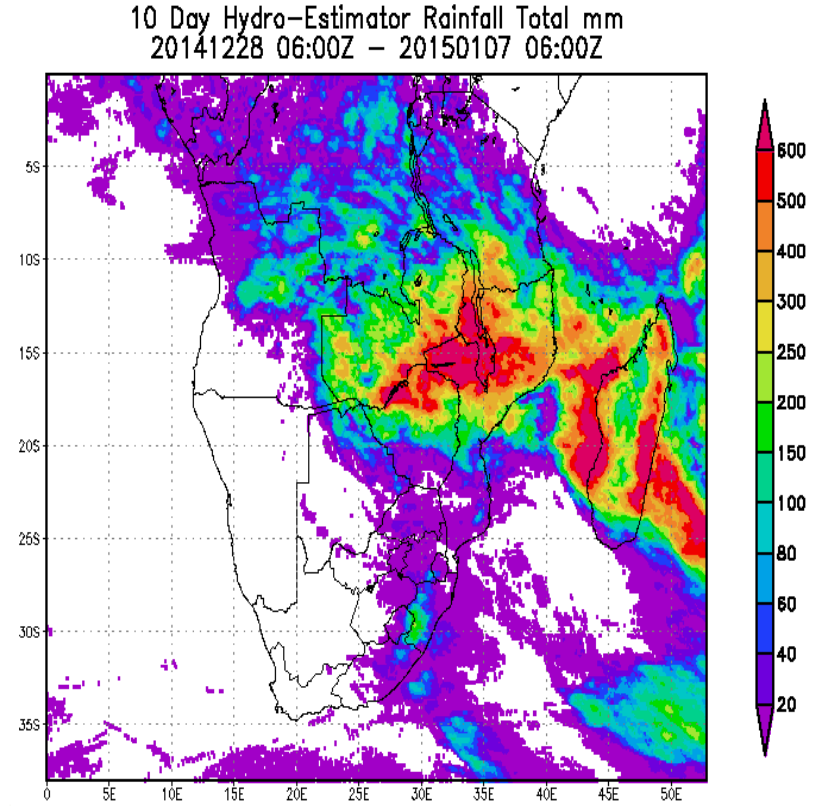
Types of forecast

i. Daily recorded Precipitation and next 24h forecast;

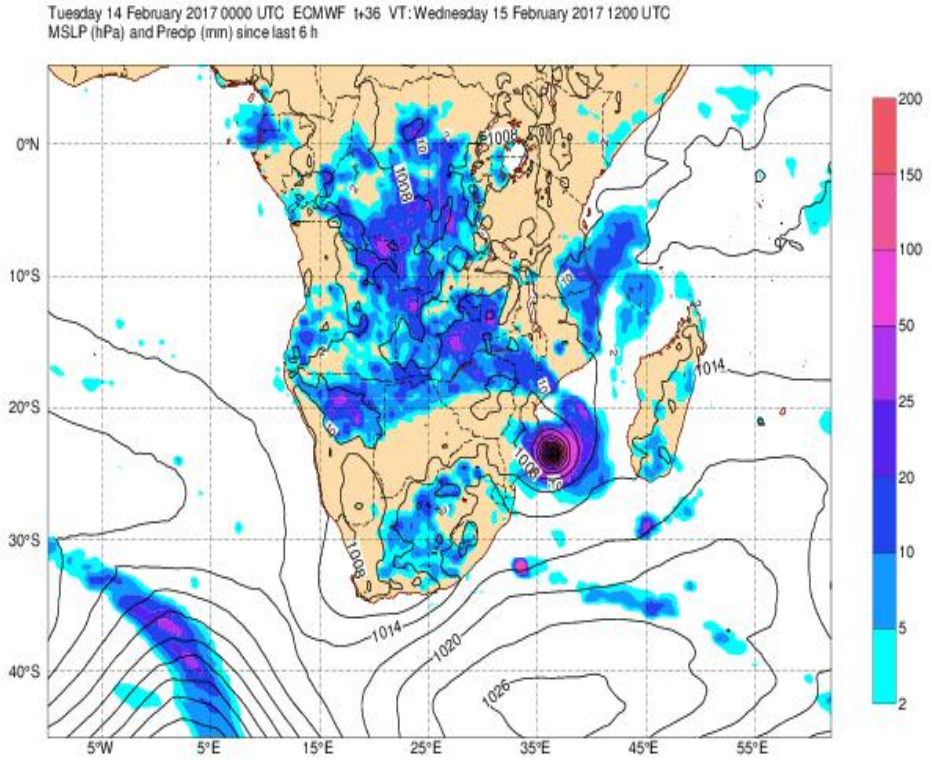
ii. Daily recorded maximum and minimum temperatures and 24h forecast

iii. Special warnings for heavy rain and strong winds, thunderstorms tropical cyclones heat waves...

Example of rainfall forecast/estimation

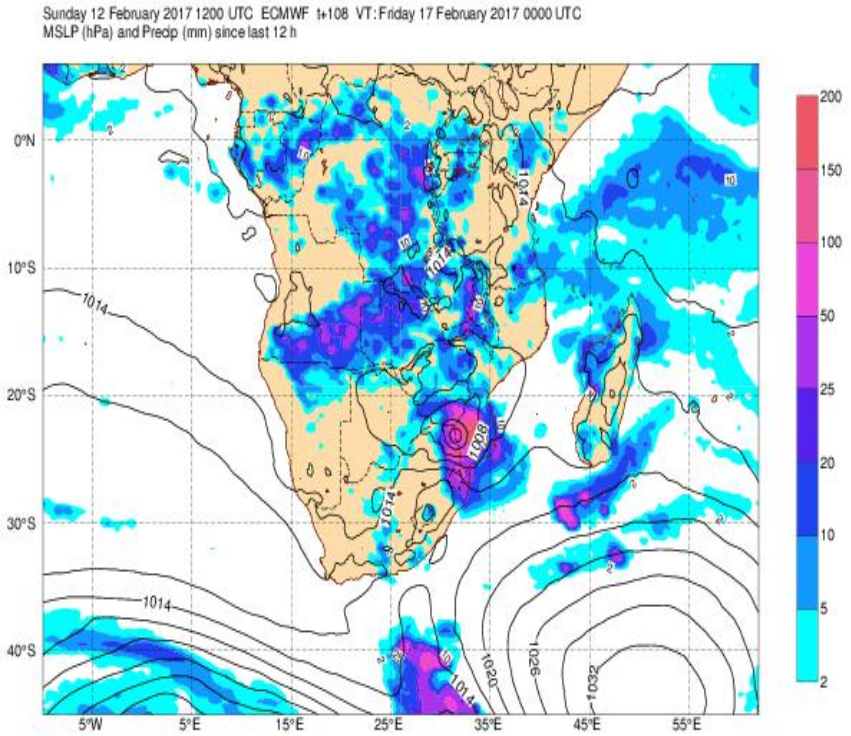


past 10 days rainfall estimation (in mm)

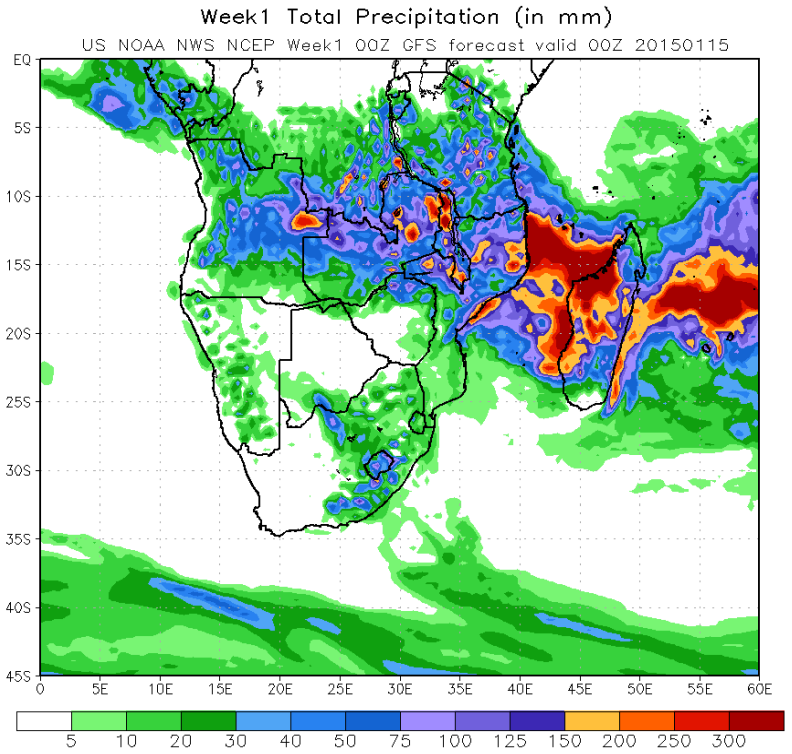


24h rainfall estimation (in mm)

Example of rainfall forecast/estimation

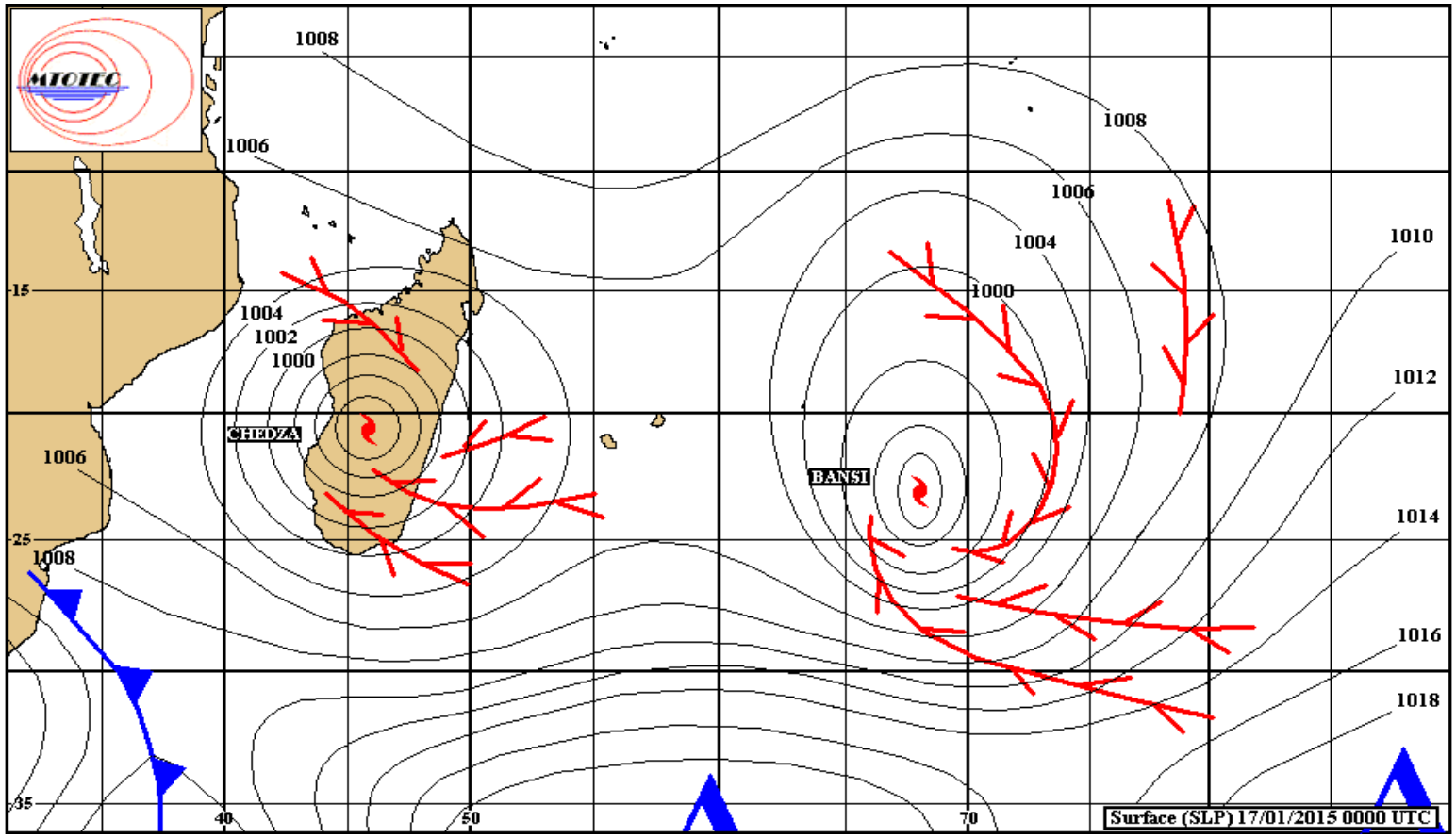


48h **rainfall estimation (in mm)**

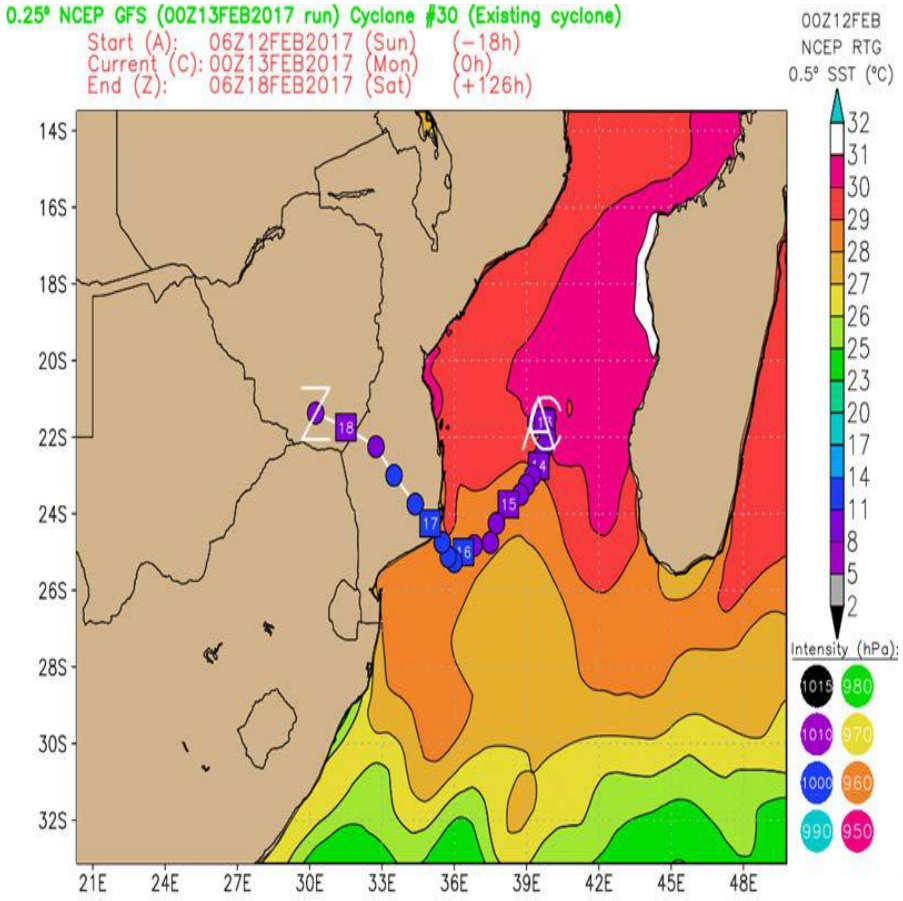


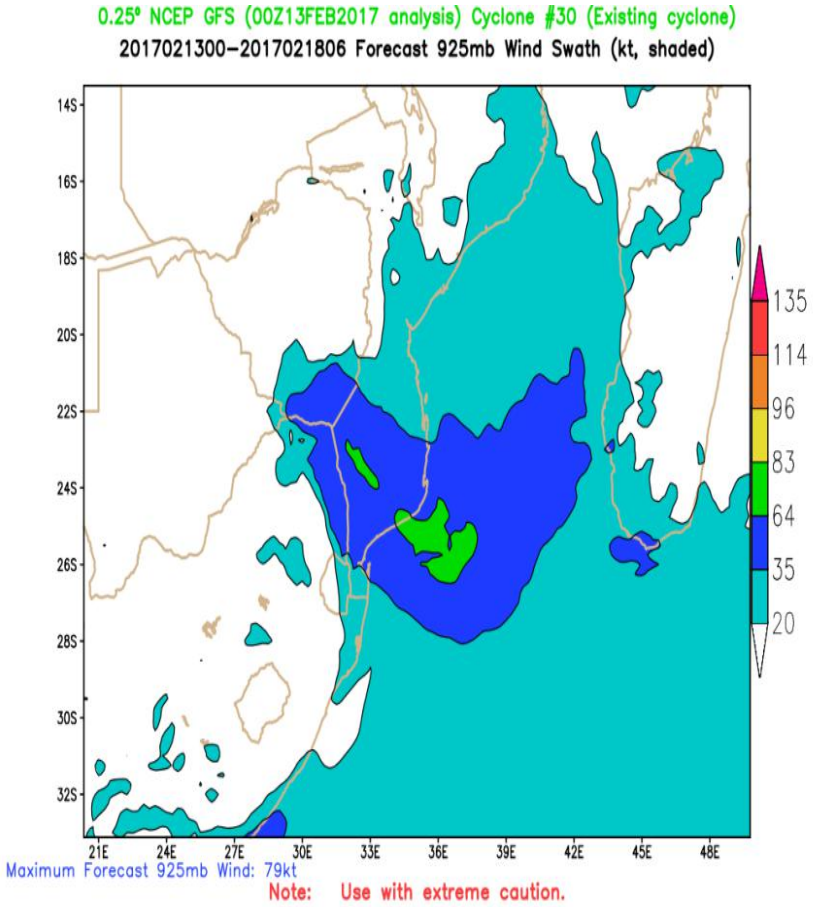
7 days rainfall estimation (in mm)

Monitoring of Cyclonic Activity



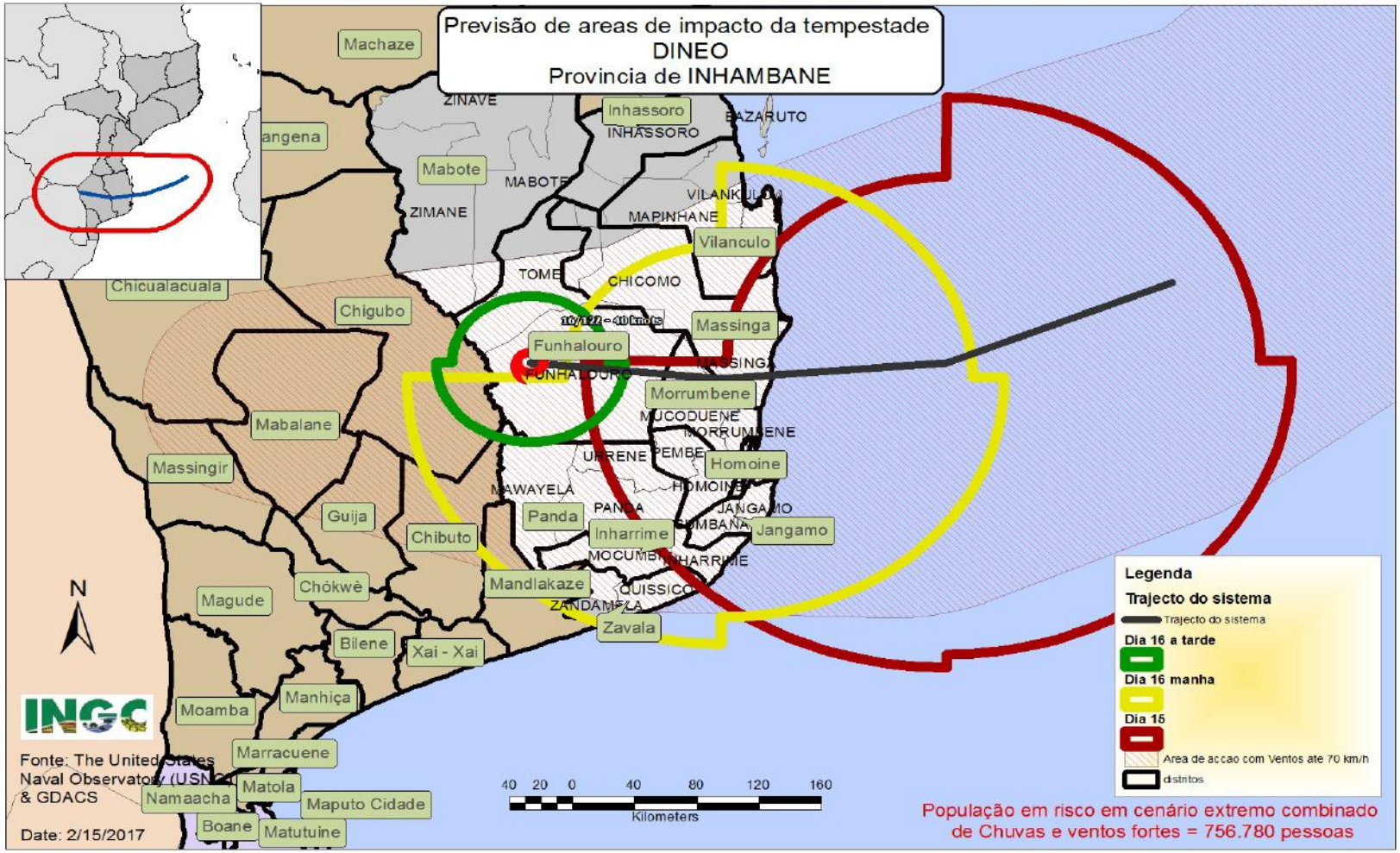
Cyclone DINEO Example: Trajectory and maximum winds of tropical depression





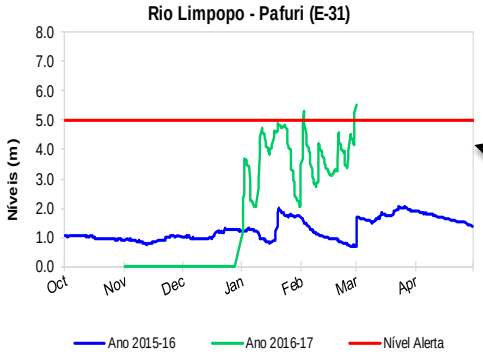
Forecast indicates that the disturbance could evolve to the stage of tropical depression and could reach the Mozambican coast along Inhambane and Gaza provinces with maximum winds that could reach 100 km/h

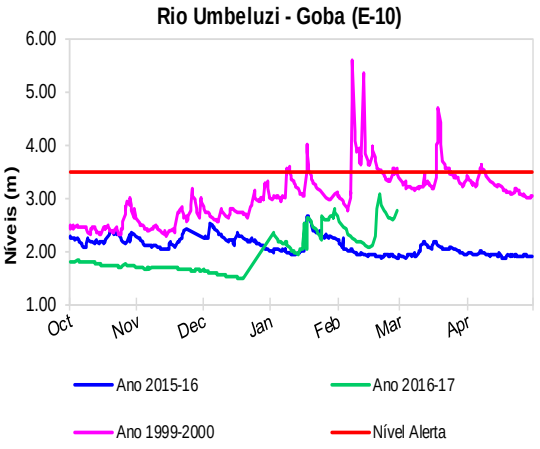
Probable Impact Areas in Inhambane Province: 15.02.2017

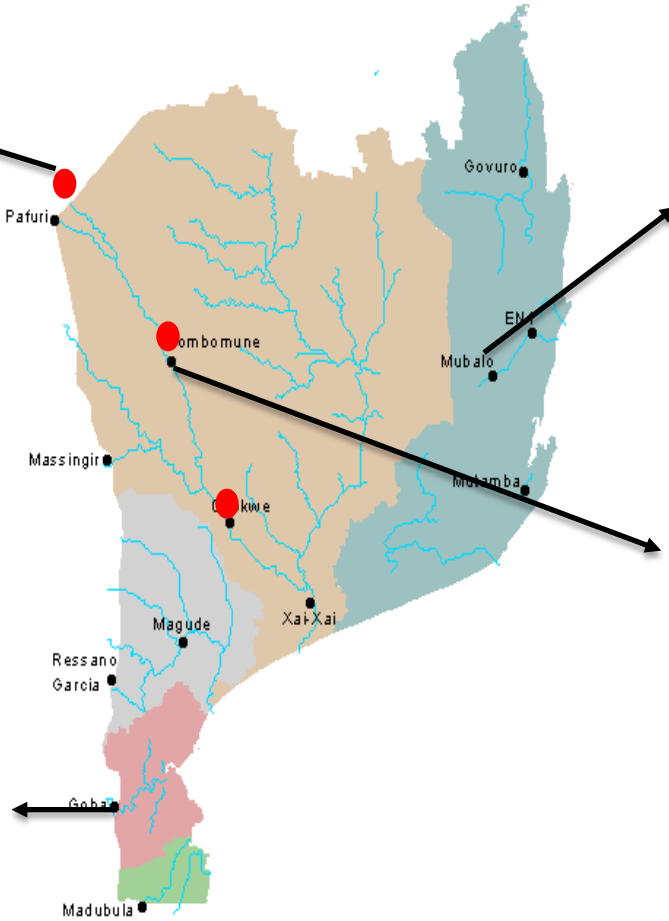


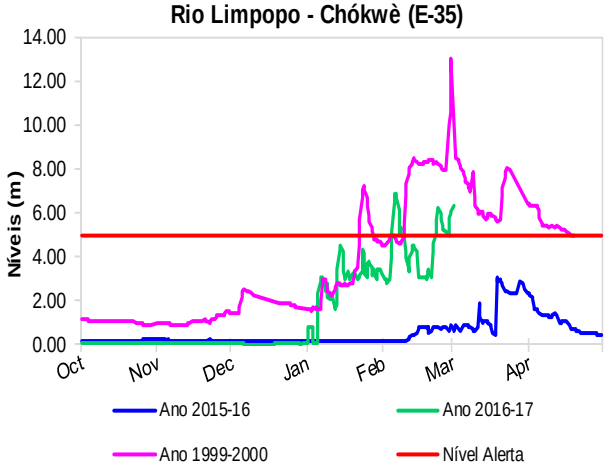
It is estimated that this system could affect, in a combined scenario of strong winds and rains, about 750,000 people in the districts identified above

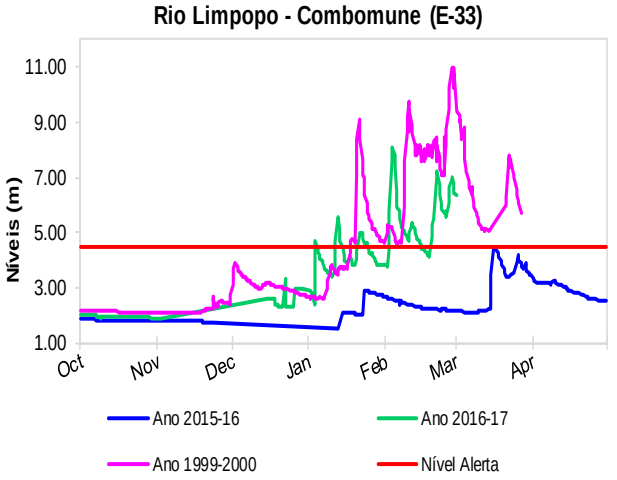
Hydrological information





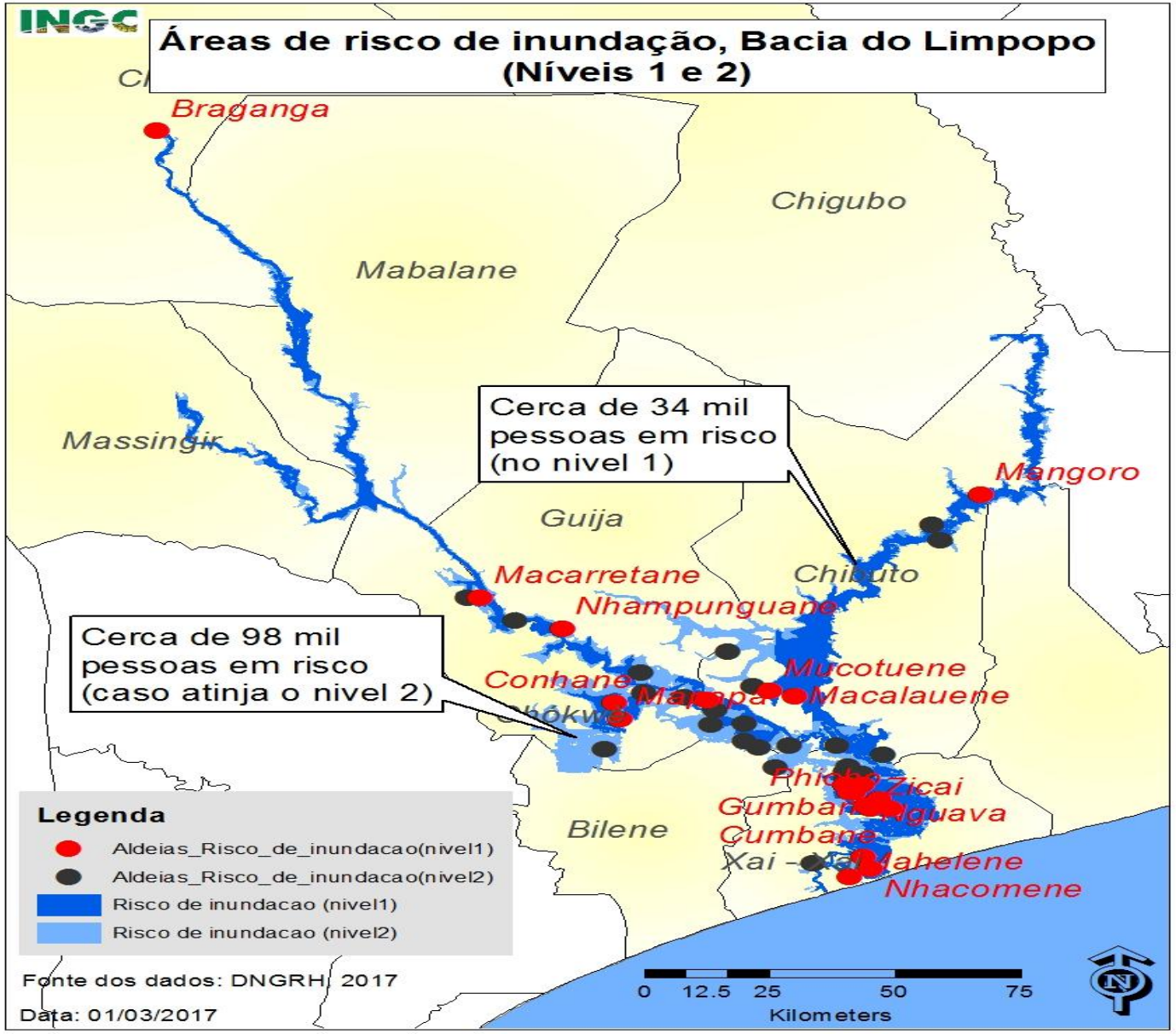






The LIMPOPO basin shows a significant increase in the volume of flow due to the contribution of amount (4600 m3 / s in B. Bridge and around 2000 m3 / s in Mwanetse). As a result, the Pafuri, Chókwe and Xai-Xai stations tend to rise. The INCOMATI basin registers oscillatory levels with a tendency to rise, while UMBELUZI and MUTAMBA tend to lower.

Probable Wave Impacts (from 01 to 04 March 2017 (flood risk areas, Limpopo basin, levels 1 and 2))



Pictures of Floods at basin of Licungo river 2015 (Zambezia Province)

Houses and roads flooded

Bridge flooded and destroyed

Pictures of destruction by DINEO cyclone (2017) – Inhambane Province

House destroyed at Maxixe cCity

Bridge destroyed (Maxixe–Inhambane crossing)

House destroyed at Maxixe City

School Destroyed

Challenges to access and use of climate information

- INGC has free access to climate information

<u>Remaining challenges</u>

i. Limited geographic coverage of hydro-meteorological network
ii. Lack of climate information products to timely respond to specific demands of end-users
iii. Technical barriers to translate and disseminate climate information in a clear and understandable language to all users
iv. Forecast and warning of meteorological events and potential impacts (multi hazard impact-based).
v. Impact matrix related to hazard (flash flood) occurrence
vi. Hourly or 6 hour forecast precipitation and possible location of flash floods occurrence.
vii. Forecast of macro scale events or phenomena's
viii. Estimate or identify vulnerable and needy persons among those affected

OBRIGADO